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# Kodikologie und Paläographie im digitalen Zeitalter 2

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# Codicology and Palaeography in the Digital Age 2

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# Agendas for Digital Palaeography in an Archaeological Context: Egypt 1800 BC

Stephen Quirke

**Abstract**

Handwriting raises issues alive in archaeological debates, philosophical and historical. In turn, by their extreme fragmentariness, the earliest archaeological manuscripts could generate usefully different questions for the field of palaeography. Here, digitisation offers new common ground for the separate disciplines in the study of the past. For current archaeological discussions of structure and agency, manuscripts pose the act of writing, between social and individual. For debates over literacy and power in part-literate societies, an archaeological hoard of manuscript fragments offers opportunities to assess our chances of knowing, for one time and place, how many writings and writers. The largest earliest group of writing on papyrus-paper comprises several thousand small fragments from Lahun in Egypt (about 1850–1750 BC). Traditional methods of recording similarity and difference across the collection can now be accelerated to a point of qualitative change, by applying image-matching software. This paper considers the potential of computer-aided palaeography for generating new research agendas.

**Zusammenfassung**

Schrift als Kulturphänomen ist ein zentraler Gegenstand archäologischer Debatten, in philosophischer wie in historiographischer Hinsicht. Dabei können die frühesten archäologischen Handschriftenfunde in ihrer extremen Fragmentierung Anstoß für weitreichende Forschungsfragen innerhalb einer allgemeinen Paläographie geben. Digitalisierung bietet hier den unterschiedlichen Disziplinen eine gemeinsame Grundlage für die Erforschung der Vergangenheit. Innerhalb der gegenwärtigen archäologischen Debatten um Struktur und Akteur (*agency*) positionieren Handschriften den Schreibakt zwischen sozialem und individuellem Handeln. Für die Diskussion über den Zusammenhang von Schriftlichkeit und Macht in teilschriftlichen Gesellschaften können lokal und zeitlich dichte achäologische Funde von Handschriftenfragmenten erstmals präzisen Aufschluss über die Anzahl von Schreibern und Schriftstücken an einem bestimmten Ort zu einer bestimmten Zeit geben. Bei den Fragmenten aus dem ägyptischen Lahun (ca. 1850–1750 v.Chr.) handelt es sich um die größte Ansammlung frühester Papyrusschriftstücke. Die traditionellen Methoden zur Feststellung von Ähnlichkeiten und Unterschieden innerhalb einer kompletten Sammlung können nun mit Hilfe

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von digitalen Bildvergleichsverfahren auf einem qualitativ neuen Niveau angewandt werden. Dieser Beitrag möchte Potential und Perspektiven einer computergestützten Paläographie für die archäologische Forschung aufzeigen.

## 1. Handwriting in Debate

### 1.1. Structure and Agency

In the twentieth century division of labour for studying pasts, philological historians parted company from archaeological fieldworkers (Andrén). Archaeological debates on structure and agency have missed ancient handwriting as a case-study of socially constrained individual actions. Here, 'action' may be conceived as the interface where two dimensions come into existence: mutually constituting agents, and structures they (the agents) live, in a dialectic ruled by conflicts expressing contradictory interests between and within each stratum.[1] In posture and body movement, writers at work experience as individuals instances of a shared activity: each may develop and express their identity in writing style, in relation to acquired skills, physical capacities, and degrees of self-control. In different historical contexts, writers may produce their materials themselves, or receive from suppliers with separate production spaces each or all of the range: ink, writing support, writing-tools and containers.

Just as speakers of a natural language do not passively reflect or label a world of things, but rather move within and contribute to that language as a conception of life (Ives), so too writers succeed or fail in communicating not in isolation, but within forms accepted in the community of writers and readers at their time, and within its traditions of learning to write and to read. Therefore handwriting is natural-historical, imbued with individual and social dimensions, and accordingly changes over time. This temporal flow creates for palaeography two of its privileged tasks: to assess the dates of manuscripts, and to re-read forgotten writing (Hofmeister et al. 268). For dating, palaeographers may find changes over time gradual or staccato; to echo the terms of Mark Stansbury, gradual change perhaps fosters evolutionary interpretation, whereas more abrupt change may encourage taxonomic periodisation. Ancient Egyptian handwriting follows both paths over the long duration. In the second millennium BC, Egyptian cursive handwriting evolved gradually for two or more centuries, before then being revised at a fixed point, as if by decree from a centralised point of learning (Roccati). Whatever the institutional channels, handwriting revision may be observed in the mid-nineteenth, fifteenth, and thirteenth centuries BC (Möller).

For the specific space and time of script learning in Egypt, secure archaeological evidence remains elusive. Like the library of Alexandria (Butler), the ancient Egyptian

[1] Callinicos 184–188, from commentary on Giddens by Margaret Archer, without the part about God.

'school' remains a mirage conjured by one line at the start of a single literary composition of the nineteenth century BC, the Teaching of Khety:[2]

> Beginning of the teaching made by the man of Tjaru (?)
> the hymn-singer (?) called Khety for his son called Pepy
> In the very time of sailing south to the Residence
> to place him in the teaching-chamber of writings
> among the children of officials, of the foremost of the Residence

By re-translating "teaching-chamber of writings" as "writing school", Egyptologists have equated ancient teaching and modern education, in a manner contested even for nineteenth century Egypt teaching (Mitchell). In the question of script learning, against the images of Greek, Roman and European Renaissance mystifications, it may be noted that the ancient Egyptian scripts provide a perfect solution for communicating the structure of the ancient Egyptian language. Their combination of specific or generic image-signs with one-, two- and three-consonantal sound-signs removes the risk of confusing the many similar-sounding words generated from its core triliteral roots. In Egypt, development of an alphabet brings no discernible progress for literacy, and is a regressive step for ability to convey the language. In the early first millennium AD, some five centuries after its first appearance in the country, the Greek alphabet was adapted to write the Egyptian language as the Coptic script (Bosson and Aufrère). Though doubtless a more international medium, the alphabet seems a major setback in conveying Egyptian language, as may be experienced still today by anyone who learns Egyptian in hieroglyphic and Coptic scripts at the same time.

With no production-spaces, and few ancient writing-kits preserved, the manuscripts and their signs in pigment and an unidentified binding medium remain the direct evidence for transmission of writing and reading over generations.

### 1.2. Literacy and Power—Assumptions—Datasets

As formalised communication deployed in control of material and intangible resources, writing is as much an exercise of power as any other act of speech or tooling. Foucault investigated institutions of power across temporal blocks of *episteme* "knowledge formation", a term more digestible to most of academic society than its Marxist original, in socio-economic history, with the vocabulary of modes of production and social formations (cf Jameson). In general, such longer-term structural history, like philosophy, risks shipwreck on the exacting details of short-term micro-history, of the kind that

[2] Translation following the synoptic edition Helck; the word here translated "hymn-singer" has also been interpreted as a rare personal name Duau, but is attested in a list of officials predominantly comprising temple staff, UC32194, Collier and Quirke 2006, 100–101.

gave philology its reputation for pedantry (cf Gran). Yet, in their practices for managing myriad fragments, philologists have discretely sustained their own philosophy, in part by declining to theorise either their own actions, or the fragmentariness of the record.[3] Disciplines addressing remoter pasts have imposed rough assumptions concerning low literacy rates, relations between power and literacy, and the presence, age and gender of the literate in ancient landscapes.[4] The internally contradictory detail and quantity of nineteenth century documents help check our assumptions, not as direct illustrations, but as reminders to return more open-mindedly to the ancient and differently fragmentary sources.

The AD 1897 census for Egypt, in the second decade of British military occupation, gives minimal levels of literacy for women in all regions, and for men outside the urban governorates (*Recensement général*):

| | Total | Governorates | Lower Egypt | Upper Egypt |
|---|---|---|---|---|
| men | 8.8% | 22.6% | 8.4% | 5.9% |
| women | 0.6% | 0.57% | 0.01% | 0.01% |

Table 1. Literacy in Egypt AD 1897.

Even leaving aside questions of criteria and methodology in such a census, such numerals need more than block-reading. Four letters from an archaeological archive of the time indicate how such literacy levels might operate in practice at rural margins.

1. On March 8th 1884, in the Nile Delta, the archaeologist Flinders Petrie recorded how he received an Arabic letter from Ali Jabri, his illiterate organiser at the Bedouin village beside the Giza pyramids (Quirke 2007: 96): "Next morning one of the boys here who can read and write (what a treasure a scribe on the premises is I cannot tell) told out in a long singsong drawl the contents of Ali's letter."
2. In November 1891, Petrie recruited five workforce supervisors at al-Lahun village, on his way south to excavate at al-Amarna. One was literate, one learning (Drower 81): "A strapping lad of about 20 is Abdallah, who has the advantage of reading & writing (as Misid also a little)."
3. On January 9th 1905, Petrie wrote to his wife Hilda (Quirke 2007: 81): "Our men have not had a single letter from Quft. Aly abd er Rahim desires you to tell Ib. that they are all well here, and wishes him to write this to Quft. They have sent several letters to Quft themselves."

[3] The relation between implicit and explicit might be added as a dimension to the diagram of knowledge construction in Cartelli and Palma 132: Fig. 2.

[4] Shubert, contesting these assumptions on gender.

4. On January 17th 1906, excavating at Tell el Retaba, Hilda noted of friendly hosts at a Nile Delta station (Quirke 2007: 88): "Two of them came over for a lesson in archaeology next day, and they write us English letters in answer to my Arabic ones, and are very obliging in procuring bread for us."

In these documents, individual and collective practices cannot easily be reduced to a binary literate/non-literate divide. Reading and writing interweave, deploying devices of literacy, orality, and, wherever individuals or groups listen, aurality (Coleman 1–33). Moreover, here English views of Egypt, ancient and modern, can be reversed by reading from Egyptian perspectives. For, on site, a nineteenth-century census-taker might have marked the London-based dig-director as illiterate, despite his economic power. Petrie knew enough Arabic to converse with excavators, and write names of people and places, but this might not qualify him as literate to the standards of a local government officer.

In Egypt 3000–1000 BC, eternity and modernity each have their medium and script (Assmann). For monuments that project life into eternity, sacralising space, the medium is stone or metal, and the script comprises signs with the same proportions as formal art (Fischer). In contrast, the writing of 'modernity', defined as the contemporary horizon of each living generation, concerns letters and accounts, and then, increasingly over time, literary, technical and religious compositions. The dominant medium on this horizon is a paper made from strips of papyrus-reed; its script comprises the signs from the script of eternity, written with a *Juncus maritimus* reed, which created more fluent and, soon, cursive forms. The writer touched the reed tip into a water-pot and onto a cake of pigment with the unidentified binding medium presumed often to be gum arabic (Tait and Leach). The dominant pigment was carbon black, the optional highlighting pigment red ochre. Writers may have obtained supplies of ready-made paper and pigment, but the sources, regularity and chains of supply are undocumented. Study of longer manuscripts confirms the written evidence for production of rolls formed of twenty joined sheets. Sheet-joins are either at regular intervals and very fine, sometimes invisible, or at irregular points and coarse, so easily detectable. Fine joins are presumably the work of professional book-producers, while rougher joins indicate points where the writer has added a sheet for extra space. Book-supply and paper-use in this world before the codex are therefore rather different to those in modern paper-production, of pages laid into quires and then bound to books. From recurrent differences in sheet-joins, it seems that Bronze Age Egyptian writers received, not page-like sheets, but the ready-made book-rolls; from a roll any fraction may be cut or torn, for separate use e.g. as letters, or to be added to book-rolls to form a longer roll. Subtracting and adding create a different inscriptional field of practice, to that of the normative printed books in modern times.

Dwarfed by the more abundant preservation of sacred inscription on stone, three larger groups of manuscripts stand out as datasets for research:

| | |
|---|---|
| Early Bronze Age 2650–2000 BC | Abusir temple business papers (Posener-Kriéger) |
| Middle Bronze Age 1850–1750 BC | Lahun temple business papers (Kaplony-Heckel 1971), town miscellaneous (Collier and Quirke 2002, 2004, 2006) |
| Late Bronze Age 1300–1050 BC | Deir el-Medina business papers, miscellaneous (Valbelle) |

The Lahun town papyri represent the earliest miscellaneous group, offering a random sample ideal for analysis. Preserved in the Petrie Museum at University College London (UCL), they form the basis for this review.

## 2. Lahun Papyri as Dataset

### 2.1. Place and Time

In the early nineteenth century BC, whoever planned kingship temples decided to locate the pyramid complex for king Senusret II at the entrance to Fayoum, near modern al-Lahun (Grajetzki). Alongside the Valley Temple of this complex, a kilometre east of the pyramid itself, at or about the same time, a new town was laid out on an orthogonal plan (Petrie 1891: pl. 14). Its name seems to have been Hetep-Senusret "Peace of Senusret" (Horváth 2009a), and its main block measures about 250 by 250 metres (500 by 500 ancient Egyptian cubits), with ten palatial houses on the north, upwind of medium and small-sized houses. An additional strip of housing and, perhaps, administrative buildings forms a contiguous western sector closer to the Valley Temple.

In 1889 Egyptian teams recruited from Madinat al-Fayum and al-Lahun cleared the town-site, in two seasons directed by Flinders Petrie, whose primary aim was to retrieve the town-plan and representative finds of its period (Petrie 1890, 1891). The archaeological generation of Petrie did not yet use survey grid or stratigraphic sections to record the horizontal and vertical relation of finds; instead, in his spring 1889 season he assigned letters to 'Ranks', meaning blocks of houses between streets. Unsurprisingly, then, for that date in the history of archaeology, find-places were only recorded for three of the five larger groups (those containing more than five separable items): Lots I+II from Rank C head, Lot III from Rank B head, Lot IV probably from middle block of Rank N; the find-spots for Lots VI and LV are not recorded (Collier and Quirke 2006). Surprisingly perhaps for current disciplinary archaeology, the prompt to record specific find-places came from a philologist, Francis Llewellyn Griffith (Collier). It is regular practice to lament the loss of exact provenance within the site, although the absence of information possibly reflects an undramatic scatter across the entire town—in itself

a caution on Egyptological low literacy estimates at least for these more urbanised landscapes. A new survey is now being directed by Zoltan Horváth of the Museum of Fine Arts Budapest (Horváth 2009b). However, the 1990s excavation team of the late Nick Millet found the site to have been almost entirely stripped of its bricks since the 1889 clearance (Frey and Knudstad).

Entrusted with publication of the papyri, Griffith thanked Petrie in print for keeping separate the material in batches as it was presented to him (Petrie 1891: 47). At least eighty 'Lots' were handed over to Petrie from across this 250x250m town, amounting to a productively random sample from a century of written output. The 1898 edition by Griffith of 65 "of the best" made the collection of Lahun papyri preserved at UCL famous, as they include the earliest legal, literary, mathematical, medical papyri, and the only veterinary manuscript from Bronze Age Egypt (Collier and Quirke 2004). Since the 1898 edition, museum staff have rescued the papyri from two World Wars, and a fire started by conservation materials (Kaplony-Heckel 1980: 293 n. 2), causing soot-damage to some frames but, fortunately, no material loss. Whether the collection can continue to survive their present Antimuseum home in a converted stables-building remains an open question for the university. By 1990, after all the moves over twelve decades of study and storage, half of the fragments had no Petrie batch-number, complicating efforts to calculate how many manuscripts, and how many writers, are present in this exceptional haul of writing. In sum, they present a prime papyrological jigsaw puzzle for archaeologists and historians of the Bronze Age.

### 2.2. Change in the nineteenth Century BC

In order to appreciate the particular challenge of Lahun handwriting, a later change may be compared for contrast. In the Hellenistic Period, the reed and language of Kemet were displaced by Greek script and diagonally-cut *phragmites* rush (Tait and Leach). The phragmites rush pen may be labelled Greek in Egyptology and papyrology, but could derive from earlier first millennium BC practice in Nubia or Assyrian west Asia. Whatever the origin of the tool, Greek and Egyptian scripts became associated with different writing-kits and materials; pigment analyses on third century BC bilingual documents have demonstrated use of lead inks for the Greek script, beside carbon-black pigment brush-stroke for Egyptian demotic (Delange, Grange, Kusko, Menei). By the first century AD, pigment and writing-tool changed from Egyptian carbon and reed to Greek lead and rush even for religious compositions in hieratic, the older cursive (Quaegebeur). The new writing-tool favours angular in place of rounded signs; sometimes it is difficult to determine which writing-tool was used, because even reed-users reproduce the angular signs that derive from writing with the cut rush. Change in writing style can be correlated here with change in instrument.


Figure 1. Lahun papyrus fragments UC32137I with angular handwriting (before 1850 BC), and UC32171J, with rounded handwriting (after 1850 BC).

No new writing equipment is available to explain the change in the reverse direction, from angular to rounded, in the aesthetic of writing practice during the nineteenth century BC. In the Lahun temple accounts, angular signs give way to rounded remarkably abruptly, in the decade preceding the reign of king Amenemhat III, about 1850 BC (Luft 21).[5] At the same time, the material as well as the verbal culture of Egypt underwent major changes in every area, leading Egyptologists now to distinguish sharply between a late and an early Middle Kingdom. The inclusion of handwriting in this cultural revolution calls for particular investigation.

## 3. Handwriting and Orthography as Egyptological starting Frames—Potential, Limitation

As in the far larger field of medieval studies (Stokes 316), both handwriting and orthography provide Egyptologists with ground for dating manuscripts. Orthography has been explored more rarely, though with particular success in dating the earliest

[5] Compare UC32137I angular with UC32171E and J, rounded, on frame of fragments Fig.1.

literary manuscripts (Dévaud). More often, researchers have targeted handwriting. A century ago, Georg Möller compiled a palaeographical reference book for Egyptology, isolating single signs by tracing from photographs or printed facsimiles of manuscripts, and including a column for the Lahun papyri (Möller). From these three volumes on hieratic (excluding the more cursive demotic), Alan Gardiner derived his own standard sign-list of hieroglyphs in his 1927 Egyptian Grammar—here by inversion the cursive everyday script became the anchor of the sacred script. Since Möller, improvements on individual readings have tended to come from new evidence in clear hieroglyphic forms, for example in the name of the town quarter nearer the pyramid-complex, Sekhem-Senusret rather than the Griffith reading Ankh-Senusret (Gunn). The Möller palaeography is intended to date undated papyri, prior to identifying individual hands. Continuing research in this tradition includes study of writings of *pa* "the" in twelfth century BC correspondence (Janssen).

Following conservation of the Lahun papyri by Bridget Leach and, after rediscovery of the smallest fragments in 1994, Renee Waltham, in 2002–2006 Mark Collier and myself published the entire collection in three volumes of transliteration and translation with CD-ROM of colour scans. From the start of our work in 1991, we found that ancient format had dictated form of sign to such an extent that nearly every inscribed fragment larger than two centimetres could be assigned to a particular type of content.[6] In effect, we felt, our content categories emerged from the signs themselves as deployed across a page or a book-roll of different dimensions, further defined by cultural choices in the presentation of certain contents. In order of quantity, the final categories were accounts, letters, and the more miscellaneous array of legal, literary, religious, medical, and mathematical. Within book-rolls, accounts rolls tend to be taller (full height roll, around 30 cm) than literary (half-heights or quarter-heights, 15–16 or 7–8 cm); heights vary for technical treatises such as the 'gynaecological' papyrus and other healing books. Legal documents tend to a layout between accounts and reports, with sign forms often close to those found in the literary and accounts rolls, whereas letters are demarcated by vertical columns introducing or sometimes framing a core of horizontal lines. Titles are not used for any content category. However, shorter 'page'-documents may have an address (letter) or contents (legal) line in the patch on the back that would face outwards after rolling and tying, sometimes secured by sealing-string and mud with stamp-seal impression, sometimes by improvisation as with a fish-hook in one instance. All layout varies within a culturally-determined physical field, the space of the lap of writer seated on the ground with legs folded.

Study since our edition has produced new joins, sometimes confirming the categories, sometimes putting them in doubt. Within the accounts fragments, it has been possible to redefine a group with distinctive large, rounded signs (Quirke 2007). Across and

[6] For layout script-styles, not secure signs of writer individuality, see Hofmeister et al. 277.

against our categories, one "religious" fragment can now be identified as part of the same manuscript as a second fragment categorised "literary religious" (Müller). This identification confirms the impact of print publication, with CD-ROM for colour information; a global army of readers can tackle problems of reading and identification of single manuscripts and individual hands, preparing discussion on broader issues such as literacy. At this point we may ask, considering that wider research access, which or indeed whether new tools are needed, and what ramifications would they bring. Palaeography has been said to tackle three main questions: when, where, and "were these different things written by the same person" (Stokes 310, cf Aussems and Brink 293). If we take as our level of resolution, not political history, but period of material culture, then the AD 1889 excavation can answer when and where as "Lahun, 1850–1750 BC", leaving the third question, how many hands, how many manuscripts. Arianna Ciula (219) emphasises how "humanities computing methods can assist in making explicit" processes of the palaeographical. Precisely to explain my Lahun project objectives to colleagues in computing/engineering, I articulate the third question as three objects for identification:

1. similar handwritings across all fragments, to map (a) dispersed manuscripts, (b) writers or writer-groups present in more than one 'Lot';
2. similar handwritings within each 'Lot' with particular attention to:

   intra-category: similar handwritings within a single category as defined by the combinations of formal features (e.g. 'letters');
   inter-category: similar handwritings across different content categories, particularly those with different layout on the page;
3. range of difference within a single manuscript to establish the parameters of difference against which to measure the apparent similars of tasks 1–2.

Underlying the three tasks are the "one writer, many hands", and "one hand, many writers". Even in the larger field of medieval manuscript studies, the "stilistische Schwankungsbreite von Schreiberhänden" has been considered a crucial factor not yet adequately researched, when particularly more skilled writers might deploy more than one handwriting style and even ductus.[7] Conversely, as Stokes notes (317), "the very question of scribal identity depends [...] on the assumption that the handwriting of no two persons is the same, and yet this assumption is not normally questioned by palaeographers". He finds reassurance in forensic science, where handwriting proves consistent with writer individuality, but also warns that this varies by degree of training of the writer or group of writers. At the greater distance of Bronze Age Egypt, research can afford assumptions even less, and needs new tools and their horizons.

[7] Hofmeister et al. 276–277 with n. 26; Stokes 315 on the typology of copying, with both imitation and influence of examplars.

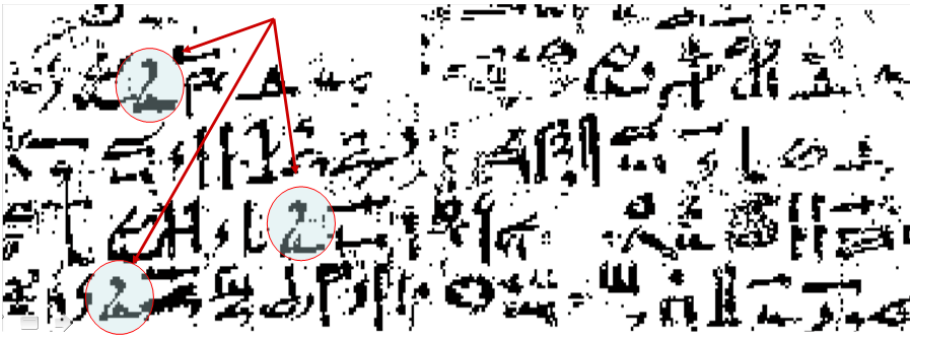

Figure 2. Tania Stathaki trial for identification of *alif* single-consonant sign in Lahun papyrus.

## 4. Computer-aided Palaeography—Trials, Potential, Agendas

From 2004, initial Imperial College London MSc projects supervised by Anthony Constantinides, demonstrated how far computer-aided palaeography could accelerate traditional tasks for the Lahun papyri. However, limitations of smaller-scale projects also became clear by the third year, anticipating the observation by Arianna Ciula on the "difficulty of maintaining a project, which was never formally funded" (Ciula 232). Despite successful character recognition, serious obstacles remained, including the need for higher resolution scanning (cf Fig. 2), and the quantity of tiny fragments. A third, more intractable obstacle, was interdisciplinary time threshold: two disciplines need time to develop deeper engagement than dual-supervised dissertations provide. Resolution is being addressed in-house by rescanning, under the supervision of Tim Weyrich at UCL Computer Science, with his new software to overcome distortions in flat-bed scanning, in particular for glass-mounted fragments. The other obstacles require longer-term approaches, for which Anthony Constantinides, his colleague Tania Stathaki, Tim Weyrich and myself envisage a postdoctoral research project, combining the philological and engineering resources available in London. Much as I needed to re-articulate the task of identification, I needed a translation back to me, as non-digital philologist. Stathaki articulated the computing tasks in these terms:

> The primary aim of identification is to locate automatically and identify signs within sequences of signs.
>
> Shape representation: Create a set of features that adequately encode the characteristics of the symbol.

> Shape matching: Endow the feature space with an appropriate similarity/dissimilarity metric.

Re-scanned, the two hundred frames with several thousand fragments can then provide an archaeological dataset to rise to the challenge: "Are there new possibilities for manuscript research to be discovered that had not been possible before?" (Aussems and Brink 294).

The Lahun town papyri offer a random sample of the handwriting from their time. This project foregrounds the distinctive archaeological combination of small size and large number of fragments. A digital approach to combined totality and fragmentariness might dictate a new quality of research and consciousness of results, true to the aim that "the digital representation of manuscripts determines scholarly work" (Vogeler xv). Specifically, digitisation delivers for analysis for the first time in practice a 'totality' of writing from Lahun 1800 BC constituted by the random sample preserved through site history and ground conditions. Computing capacity here shifts from auxiliary "computer-aided" to "computer-enabled palaeography". The totalising horizon of the sheerly fragmentary calls for massively increased quantifiable precision, and stimulates more radical ambition from interdisciplinary history: to delineate for analysis an unprecedented profile of literacy in one time/place case-study—Egypt 1800 BC. Computer-enabled palaeography moves Egyptology on to a more open forum of cultural and historical studies.

By revalorising the quantitative, and theorising the qualitative aspect of the archaeological fragment, the project delivers one specific consequence of considerable importance for studies of ancient literacy: a renewed focus on the aspect of numeracy. Accountancy documents constitute by far the greater part of the Lahun manuscripts, from both temple and town. Yet narrative, in particular literary, attracts vastly more attention in Egyptology (Moreno Garcia). A project involving different sciences may return us to the starting-point of the writing, which is, in bulk, counting. Here the mark that lies on the border of, or even outside, script, remains under-researched for Egyptian manuscripts, but precisely this border is providing fruitful ground for digital palaeography initiatives (Hofmeister et al. 278). Lahun check-marks are distinguished sometimes by form, but also by alignment and repetition; on fragment UC32130 a workforce name-list deploys check-marks for names, but also repeats the sign for "child" in check-mark style. In other instances, marks may operate differently: fragment UC32107A presents sequences of marks that occur on several other papyri, interpretable as multiplication device (Imhausen). Numeracy and literacy cannot be understood without the other; formal and quantitative analytical programmes bring out forcefully the interpenetration of these two dimensions of writing.

By providing new access and flexibility to the fixed signs on the papyrus-paper, the interdisciplinary approach contributes new resources in tackling some of the deepest

problems in history-writing. In practice we still remain silent on the gaps in our knowledge of ancient literacy, which we still tend to fill with cultural assumptions on ethnicity and class. The dual motif of Scribe with Priest has a notable history of abuse (Ferro) in European literatures, including academic writing, reifying the social relations of worlds that are 'other'. In Eurocentric histories of north Africa and west Asia, the motif of a Scribe-Priest society continually reinscribes orientalist attitudes in disciplinary treatments of ancient literacy. In considerations of class, wittingly or otherwise, historians and archaeologists have tended to leave intact assumed absolute dividing-lines in part-literate societies—assumptions that may have most to do with reinforcing faultlines of their own societies. Archaeological provenanced fragments might alter discussions of 'integral palaeography' (Ciula 221) over the extent to which writers at particular times and places did or did not perceive themselves as a cohesive community.[8] In such areas I anticipate repercussions from the ability to match signs to 'hands', and on this basis to begin to discuss the meaning as well as identities of 'hand'. This opening may be the critical contribution from datasets of archaeological fragments, if the equation 'hand' = 'a person' remains the fundamental assumption required for the palaeographical operation (Stokes 317). Exponential acceleration of handwriting research in fragmented datasets could simultaneously re-focus attention from identifying individual writer or author(ity), to investigating of broader, more communal lives of those individuals, replacing the question 'who/where is this writer' with 'how did writing live' in a particular time/place (cf Stansbury 248).

Computing approaches begin not by replacing, but by enhancing and extending previous skills, and their application requires a balance in design of a developing research agenda. Palaeographers may refine localised questions manually, and bring insights of historical subject specialisms to bear on quantitative results. However, despite endorsement by critical writers such as Benjamin and Gramsci (Crehan 30–31), philology alone offers little defence against dehumanisation, after its role in constructing the inhuman power relations of the colonial regime. To defuse the philologist, a differently skilled, third party must at some point be invited, in order to retain the most human element in the story, the human body: the practised calligrapher seems best placed to assess automated analyses for "reconstructing the motion of the scribe's pen on the page" (Stansbury 248). These three roles could create out of quantitative and qualitative results a new agenda for understanding major changes beyond individual or collective intention. At the same time, such multiple partnerships might be better placed to foster "the opening towards the society of the research work and its transparency" (Cartelli and Palma 133). The abrupt shift in writing style around 1850 BC belongs within a major transformation in material cultural history. Handwriting fits tangibly

[8] This approach seeks to problematise productively each corner of the clearly articulated model individual-community-society, Cartelli and Palma 132.

into patterns of change, but without clear motivations or agendas yet identified. What can such a seemingly innocuous shift express or reflect? Will measuring it help us? The social historical expectations on the digital age run ambitiously high.

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